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Sarah O'Neal

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The 2011 annual AFS meeting in Seattle included a five-day Fisheries and Hard Rock Mining symposium (sponsored by Trout Unlimited, the Pebble Limited Partnership, and the AFS Water Quality Section) that covered diverse topics and disciplines, including aquatic ecology, copper toxicity, mine waste mitigation, and mining regulation. Because of widespread … vide a brief synopsis of the session for *Fisheries* readers.

> **In addition to impairing gill function, Cu can be acutely toxic through effects on the peripheral nervous system**

Five talks focused on the effects of metal mines on aquatic ecosystems. In several case studies from North and South America, mine effects led to increased incidence of diatom structural anomalies and percent tolerant individuals … brate, and diatom assemblage structure at local and catchment scales. Another study concluded that metal contamination of streams remains in the mining district in Idaho's N.F. Coeur D'Alene River Basin more than 100 years after mining began, even where metal concentrations are below water quality standards, poor physical habitat structure, elevated sediment … ada found otolith microchemistry was useful for evaluating the extent of metal contamination and the locations and timing of … age of Alaska, where 12 million acres of state land … to a mining use despite a high water table, waters with low neutralizing capacity, active geologic faults, and salmonid … Because of those environmental conditions, development of the proposed Pebble Mine — a 10.8 billion ton copper (Cu) prospect in the Bristol Bay drainage — could threaten the … who depend on salmon for income and subsistence.

Five presenters discussed Cu toxicity to salmonids and water quality criteria. In addition to impairing gill function, Cu can be acutely toxic through effects on the peripheral nervous system (e.g., olfaction, lateral line). For example, in low ionic strength water, olfactory inhibition occurs as low as … 10 minutes at 10 µg Cu/L (ppb). A 1 h exposure to … response by juvenile Chinook salmon. If they can, … avoid copper after exposure to copper at concentrations and durations that are neurotoxic to the pe… reproduce, feed, avoid predators, and migrate. Wat… ability and toxicity. In particular, increasing dissolved organic carbon (DOC) concentrations can provide protection against olfactory impairment. One presenter showed instances where the USEPA's biotic ligand model (BLM) based criterion, which incorporates a number of water quality variables (temperature, pH, alkalinity, DOC, and the major inorganic cations and anions), was more consistently protective against olfactory impairment in salmonids than hardness based Cu criteria … studies. Salmonid olfaction was not impaired below BLM-based Cu criteria in this study. Only a few states are considering use of the BLM to derive regulatory criteria. Hardness based criteria were sometimes deemed under-protective or over-protective, depending on water hardness.

Mine waste mitigation and disposal was the focus of … speakers. A 2009 U.S. Supreme Court decision upheld disposal of Kensington Mine tailings into a lake in Alaska, … in Canada exempted water bodies from Fisheries Act protections. The cost savings of using a natural lake for disposal will likely lead to increased use of lakes for … purposes in both countries. In both nations, there is a need … the world's ground and surface waters. The Fraser River has a 150 y history of mining, with 50 active mines … procedures focus on separating tailings and mines from w… subaqueous waste disposal, and tailings covers. Careful pla…

Capture and treatment of natural (pre-mining), metal-laden surface waters, coupled with isolation and treatment of min

salmonid range expansion in Red Dog Creek, Alaska; however, perpetual, costly treatment and maintenance will be required to maintain this condition in perpetuity. Removal of the Milltown Dam, Montana (driven by both public health and ecological

the removal of a dam/reservoir and 2.2 M cubic yards of contaminated sediments; further rehabilitation and redevelopment is estimated to raise the costs to $150 M. Rehabilitation of the S.F. Coeur d'Alene River Basin is estimated to cost $1.3 B. Although abandoned mines may have substantial negative environmental and economic legacies, similar problems have been

often worse than that predicted in environmental impact statements and environmental assessments. Water quality standards

moderate to high contaminant leaching potential. Acid drainage

assessments for those mines predicted that acid drainage would not occur. Water quality exceedances are associated with inadequate pre-mining hydrologic and geochemical characterization and failures in the performance of installed mitigation measures. Another study concluded that the major limiting fac

physical habitat structure) and if salmonids are not potentially present. Mitigation is more successful if the entire ecosystem is considered and involves diverse stakeholders.

Legal and educational issues were discussed by three

resolutions presented at an annual miners' convention in Alaska drew considerable interest by — and thoughtful exchanges from — miners, indicating the value of public education on mining issues. Legal liability is a major hindrance to reclaiming abandoned mines. Under current laws, a second party assumes liability for the site when it implements rehabilitation or restoration. Legislation to provide Good Samaritan protections for conservation groups interested in mine clean-up could aid in the rehabilitation of abandoned mine lands. The USEPA ability to regulate and remediate mine wastes is limited under the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which established Superfund. Funding for Superfund is no longer provided through taxes on industries; rather, it is provided by uncertain Congressional appropriations, and the burdens of cleanup are borne by ta rather than pollution-producing industries—although some mining companies do pay for cleanups themselves. One s

cover the true costs of potential human and ecological l

accurately estimate in advance. Additional work by US directed toward clean-up and compliance includes new regulations, guidance documents, and permit restrictions con mine waste disposal.

In light of the information presented in Seattle regar Fisheries and Hard Rock Mining, we recommend a numb policy changes to hard rock mining law and regulations, not all the session participants might agree with every r mendation. Those include:

logical use designations, quantitative chemical, physi and biological criteria, and quantitative enginee standards with appropriate safety factors.

evaluation and improvement of mitigation measures.

other uses of public lands rather than giving prima mining.

hard rock exploration and development.

ence conditions, or incorporate compensation into esti

tion and/or requiring perpetual water treatment.

degrade water quality.

of regulations.

tees.

clean-up of abandoned mines.

fects of mining on terrestrial and aquatic life, and costs for mitigation.